A Bioeconomic Model of Recreational Angling in the New England Groundfish Fishery

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Recreational Fisheries Data and Model Needs Workshop

July 26, 2011

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Overview

A framework for predicting the economic effects of changes in recreational fishing policy

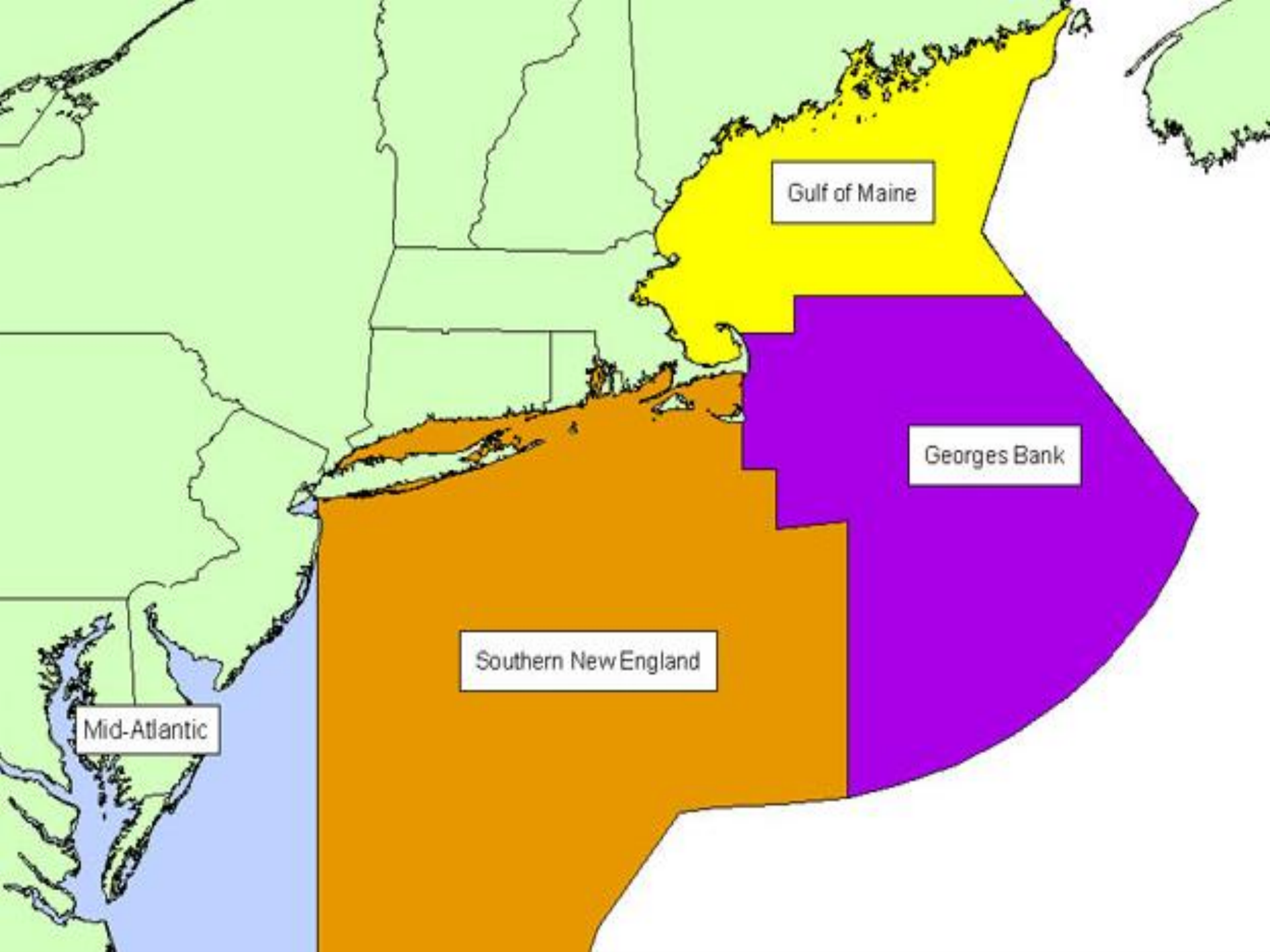
- A RUM from a Choice Experiment (CE) Survey
  - Incorporates age-class biomass projections
- Simulations to quantify the effects of different regulatory scenarios on angler effort, catch, expenditures and welfare
- Regional SAM-IO model (IMPLAN) to examine the impact on the wider regional economy

New England Groundfish

- Gulf of Maine Atlantic cod, haddock, and pollock
- Meat fisheries
- Strict measures in place for all 3 species
  - Minimum size restrictions (all 3)

  (cod 24”, haddock 18”, pollock 19”)
  - Possession limits for cod

  (10 per angler)
  - Closed seasons for cod
  - ACL


Gulf of Maine
Georges Bank
Southern New England
Mid-Atlantic

Choice Experiment Survey

Add-on to NMFS' MRFSS Survey in 2009 (ME-NJ)

- Voluntary mail follow-up
- Dillman surveying approach

Five Components

- Description of study
- A species information page
- Screener questions
- Demographic questions
- CE questions

SECTION B: SALTWATER FISHING TRIPS

Please compare Trip A, Trip B, and Trip C in the table below, then answer questions **1** and **2**.
Compare only the trips on this page. Do not compare these trips to trips on other pages in this survey.
Assume that the trips below are identical in every way except for the features listed in the table.
All regulations remain as they are today unless otherwise noted in the table below.

	TRIP FEATURES	TRIP A	TRIP B	TRIP C
REGULATIONS	**DAILY BAG (TAKE) LIMIT** Number of fish you can legally keep per day.	4 Pollock	10 Cod	
REGULATIONS	**MINIMUM SIZE LIMIT** Smallest fish you can legally keep of this species.	23 inch Pollock	22 inch Cod	
CATCH	**NUMBER OF LEGAL-SIZE FISH YOU CATCH** These fish are at least legal minimum size. Some fish are released if you catch more than the daily bag limit.	10 Pollock	1 Cod	
CATCH	**NUMBER OF UNDERSIZED FISH YOU CATCH** These fish are below the legal minimum size. All of these fish must be released.	1 Pollock	3 Cod	Do something other than saltwater fishing.
TRIP DETAILS	**NUMBER OF OTHER FISH YOU KEEP** Other fish you catch on this trip that can be legally kept.	3 Cod 6 Haddock	1 Haddock 3 Pollock	
TRIP DETAILS	**TRIP LENGTH** Total time purchased for this trip.	8 Hours	12 Hours	
TRIP DETAILS	**TOTAL TRIP COST** YOUR share of the fishing trip cost, including bait, ice, fishing equipment, daily license fees, boat rental fees, boat fuel, and round trip transportation costs associated with traveling to and from the fishing location. Travel costs may include vehicle fuel, car rental, tolls, airfare, and parking. This cost does not include the price of food or drink.	$312	$276	

1 I like this trip best:
(Please mark the **ONE** option **YOU** like best with a ☑ or ☒)

TRIP A ☐ TRIP B ☐ TRIP C ☐

2 Please rate the trips listed in the table above. (Circle the number that reflects your opinion best.)

TRIP A	*DISLIKE*	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	*LIKE*
TRIP B	*DISLIKE*	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	*LIKE*
TRIP C	*DISLIKE*	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	*LIKE*

Attributes and Levels in CE

Attribute	Level
Bag limits	2, 4, 8, 10
Size limits:	
Cod	15”, 16”, 17”, 19”, 21”, 23”, 25
Haddock	15”, 18”, 20”, 23”, 24”, 25”, 26
Pollock	15”, 16”, 28”, 22”, 24”, 25”, 26
Number of legal sized fish	1, 3, 6, 10
Number of undersized fish	1, 3, 6
Number of other fish	1, 3, 6, 10
Trip length (hours)	2, 4, 6, 8, 10, 12
Shore mode trip cost ($/trip)	$15, $35, $60, $90, $120, $150
All other modes trip cost:	
Hourly trip cost ($/hr.)	$15, $35, $60, $90
Total trip cost ($/trip=$/hr. x # hrs.)	$30-$1080

Response Rates by State and Residency

Intercept State	Mailed	Resident Completed	Non-resident Completed	Total Completed	Completion Rate
Connecticut	34	10	3	13	38%
Maine	265	67	58	125	47%
Massachusetts	1238	272	168	440	36%
New Hampshire	536	124	66	190	35%
New Jersey	1421	310	124	434	31%
New York	725	157	7	164	23%
Rhode Island	358	48	77	125	35%
Total	***4,577***	***988***	***503***	***1491***	***33%***

Simulations

- Conducted to predict the impact of bag and size limits on angler effort, welfare and total trip expenditures using the choice experiment data in the RUM, parameters from stock assessment models and historic catch data.

- Simulations attempt to replicate actual fishing behavior on a given trip

Simulated Catch Estimates (2011)

Regulations	Total Cod Kept	Total Cod Released	Total Haddock Kept	Total Haddock Released
C: 20", 20 fish; H: 14", no limit	1,577,657	306,765	831,986	120,793
C: 20", 10 fish; H: 18", no limit	1,353,607	361,907	1,057,711	44,672
C: 22", 15 fish; H: 16", no limit	1,354,688	362,450	1,087,602	15,151
C: 22", 15 fish; H: 18", no limit	1,352,190	361,156	1,022,110	79,304
C: 22", 10 fish; H: 16", no limit	1,235,208	329,453	890,843	37,312
C: 22", 10 fish; H: 20", 15 fish	1,270,070	488,950	1,055,599	44,574
C: 24", 10 fish; H: 16", no limit	1,268,058	487,609	998,981	99,489
C: 24", 10 fish; H: 18", no limit	1,405,338	273,167	939,935	93,111
C: 24", 8 fish; H: 18", 10 fish	1,408,913	274,761	1,088,940	15,178
C: 24", 10 fish; H: 19", no limit	1,581,806	308,683	1,059,518	44,802
C: 26", 10 fish; H: 18", no limit	1,582,731	309,122	1,089,434	15,189
C: 26", 10 fish; H: 20", no limit	910,124	343,543	824,481	119,068
C: 26", 8 fish; H: 20", 10 fish	1,771,344	182,961	1,101,506	4,446
C: 26", 5 fish; H: 21", 10 fish	1,477,119	152,346	1,059,803	44,856

Simulated Mean WTP per Trip (2011)

Regulations	Linear	Nonlinear	Nonlinear-User
C: 20", 20 fish; H: 14", no limit	$96.17	$116.66	$122.85
C: 20", 10 fish; H: 18", no limit	$84.26	$109.70	$115.67
C: 22", 15 fish; H: 16", no limit	$90.35	$114.38	$120.55
C: 22", 15 fish; H: 18", no limit	$89.40	$113.92	$120.17
C: 22", 10 fish; H: 16", no limit	$84.09	$110.33	$116.29
C: 22", 10 fish; H: 20", 15 fish	$79.04	$108.04	$114.16
C: 24", 10 fish; H: 16", no limit	$83.18	$110.09	$116.07
C: 24", 10 fish; H: 18", no limit	$82.22	$109.62	$115.68
C: 24", 8 fish; H: 18", 10 fish	$71.85	$103.78	$109.54
C: 24", 10 fish; H: 19", no limit	$81.12	$109.04	$115.17
C: 26", 10 fish; H: 18", no limit	$80.72	$108.77	$114.82
C: 26", 10 fish; H: 20", no limit	$78.97	$107.83	$114.00
C: 26", 8 fish; H: 20", 10 fish	$81.74	$110.14	$116.47
C: 26", 5 fish; H: 21", 10 fish	$60.35	$93.60	$99.09

Simulated Effort Estimates (2011)

Regulations	Linear	Nonlinear	Nonlinear-User
C: 20", 20 fish; H: 14", no limit	300,833	352,033	351,407
C: 20", 10 fish; H: 18", no limit	295,695	349,455	349,049
C: 22", 15 fish; H: 16", no limit	297,652	351,249	350,723
C: 22", 15 fish; H: 18", no limit	297,065	350,744	350,309
C: 22", 10 fish; H: 16", no limit	294,908	349,976	349,551
C: 22", 10 fish; H: 20", 15 fish	292,544	348,290	348,063
C: 24", 10 fish; H: 16", no limit	293,901	349,579	349,170
C: 24", 10 fish; H: 18", no limit	**293,311**	**349,052**	**348,728**
C: 24", 8 fish; H: 18", 10 fish	289,044	347,016	346,739
C: 24", 10 fish; H: 19", no limit	292,485	348,398	348,152
C: 26", 10 fish; H: 18", no limit	291,807	347,931	347,663
C: 26", 10 fish; H: 20", no limit	290,517	346,907	346,783
C: 26", 8 fish; H: 20", 10 fish	293,361	348,402	348,244
C: 26", 5 fish; H: 21", 10 fish	279,512	340,135	340,269

Simulated Total WTP, Trip Costs, Consumer Surplus (2011)

Regulations	Total WTP	Total Angler Expenditures ($1,000s)	Total Consumer Surplus
C: 20", 20 fish; H: 14", no limit	$43,193	$23,048	$20,145
C: 20", 10 fish; H: 18", no limit	$40,370	$22,582	$17,788
C: 22", 15 fish; H: 16", no limit	$42,365	$22,979	$19,386
C: 22", 15 fish; H: 18", no limit	$42,202	$22,933	$19,269
C: 22", 10 fish; H: 16", no limit	$40,661	$22,718	$17,943
C: 22", 10 fish; H: 20", 15 fish	$39,791	$22,516	$17,275
C: 24", 10 fish; H: 16", no limit	$40,595	$22,701	$17,894
C: 24", 10 fish; H: 18", no limit	$40,428	$22,649	$17,779
C: 24", 8 fish; H: 18", 10 fish	$37,999	$22,258	$15,741
C: 24", 10 fish; H: 19", no limit	$40,209	$22,578	$17,631
C: 26", 10 fish; H: 18", no limit	$40,153	$22,553	$17,600
C: 26", 10 fish; H: 20", no limit	$39,803	$22,445	$17,358
C: 26", 8 fish; H: 20", 10 fish	$40,709	$22,631	$18,078
C: 26", 5 fish; H: 21", 10 fish	$33,742	$21,312	$12,430

Glossy-eyes Problem

- Policy-makers are more familiar with economic impact measures than economic welfare measures
- How employment, income and taxes will be impacted by regulatory changes
- Provide both types of measures in the policy arena

Input-Output Model

- IMPLAN data and software for ME, NH, and MA used to construct and estimate a SAM-based I/O model
- Trip expenditure data collected in 2006 from anglers in ME, NH, and MA used to breakout the total trip costs obtained from the CE survey into specific expenditure categories (e.g., fuel, ice, bait, etc.)
- Total expenses by trip category were fed into IMPLAN and applied to the appropriate multipliers

Regional Economic Impacts (2011)

Regulations	Employment	Labor Income	Value-Added	Output
	(jobs)		($1,000s)	
C: 20", 20 fish; H: 14", no limit	290	$13,730	$20,866	$31,221
C: 20", 10 fish; H: 18", no limit	286	$13,576	$20,616	$30,782
C: 22", 15 fish; H: 16", no limit	289	$13,706	$20,825	$31,148
C: 22", 15 fish; H: 18", no limit	288	$13,682	$20,786	$31,081
C: 22", 10 fish; H: 16", no limit	287	$13,624	$20,695	$30,918
C: 22", 10 fish; H: 20", 15 fish	285	$13,539	$20,554	$30,673
C: 24", 10 fish; H: 16", no limit	287	$13,618	$20,685	$30,900
C: 24", 10 fish; H: 18", no limit	286	$13,592	$20,641	$30,825
C: 24", 8 fish; H: 18", 10 fish	283	$13,466	$20,440	$30,472
C: 24", 10 fish; H: 19", no limit	285	$13,557	$20,583	$30,725
C: 26", 10 fish; H: 18", no limit	285	$13,567	$20,600	$30,747
C: 26", 10 fish; H: 20", no limit	284	$13,521	$20,524	$30,616
C: 26", 8 fish; H: 20", 10 fish	286	$13,580	$20,621	$30,789
C: 26", 5 fish; H: 21", 10 fish	275	$13,149	$19,929	$29,578

Typical Assessment Procedure

- Affected effort (retrospective assessment)
  - Estimate the number of recreational fishing trips from the previous year (MRFSS data) that would have been affected by the proposed management measures
- Assess economic impact losses under two hypothetical scenarios:
  - 10% and 20% reduction in the number of affected marine recreational fishing trips

Future Work

- Model will be used in future economic assessments of changes in recreational management measures for groundfish
- Develop interactive WEB query tool for policymakers
- Similar model being developed for summer flounder, scup and black sea bass in the Northeast